

Intelligibility and Comprehensibility of Korean English Speakers' Phonological Features in Lingua Franca Listening Contexts

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This study investigated L2 English listeners' intelligibility and comprehensibility ratings of L2 English recordings of L1 Korean speakers' speech. Specifically, it considered which segmentals and features resulting from Korean phonotactics cause a breakdown in Korean speakers' L2 English intelligibility and comprehensibility for Mandarin L1-background L2 English speakers. As Korean speakers use English as a lingua franca primarily with their L1 Mandarin speaking neighbours, recordings of scripted and unscripted speech of Korean university students were sent to L1 Mandarin raters in mainland China and Taiwan, who rated utterances for intelligibility and comprehensibility. Findings showed that the most frequently mistranscribed features were epenthesis (inclusion of extra vowels to separate clustered consonants), substitution of nasals for plosives between vowels and sonorant consonants, and the consonant-vowel combination [wʊ]. Findings also suggest that less problematic features, such as [əʊ], /r/, and the distinction between [ʊ] and [u], are at times aided by similar realisations by L2 listeners.

Keywords: Intelligibility, comprehensibility, English as a lingua franca, Korea, pronunciation

Introduction

Tench (1981, p. 1) asserted that “if a learner’s general aim is to talk intelligibly to others in another language, a reasonable pronunciation is important”. *Intelligibility* is defined by Munro and Derwing (1995) as the extent to which utterances are understood. Allied to intelligibility is *comprehensibility*, which Levis (2018, p. 12) defines as “the degree of effort involved in understanding”. In other words, intelligibility is how *much* is understood, while comprehensibility is how *easily* it is understood. In this paper we consider the intelligibility and comprehensibility of spoken language. Derwing and Munro (1997) find that these constructs correlate moderately (Z -transformed Pearson’s $r=.51, p<.05$), but T. Kim (2008) finds no such correlation, so both constructs warrant investigation. Saito (2011) finds that intelligibility and comprehensibility depend on phonology more for L2 listeners than for L1 listeners, who rely on lexis, syntax, and context; and as Levis (2018, p. 11) asserts, L2 users’ language differs most from L1 users’ in pronunciation. Since L1 pronunciation is difficult to attain, intelligibility and comprehensibility of L2 users’ pronunciation are clearly important for L2 speakers. However, the bulk of research into intelligibility and comprehensibility has used participants from Kachru’s (1982, 1985) *Inner Circle* (Anglophone countries) to rate L2 speech. Given the widespread increase in English use between L2 speakers, more studies investigating these constructs in L2-only interactions are warranted to gain a more comprehensive and up-to-date understanding of the phenomenon of English as a lingua franca (ELF). ELF refers to the use of English “among speakers of different first languages for whom English is the communicative language of choice, and often the only option” (Seidlhofer, 2011, p. 7). Proponents of ELF argue that the L1 English

speaker is becoming less relevant to global English communication, challenging long-held standards of 'native' English pronunciation benchmarks.

The spread of English as a global lingua franca has been explored within the paradigm of Global Englishes—an umbrella term to capture the shared ideologies of ELF and World Englishes (the study of the many diverse English varieties, and of their use in diverse sociolinguistic contexts) (Galloway, 2017). Global Englishes research complicates intelligibility and comprehensibility because it problematises 'native' norms' position as the only benchmarks for successful lingua franca use. In the context of Global Englishes, the assumed target interlocutor within comprehensibility and intelligibility studies must be revised so these constructs may be explored more accurately in an L2-L2 English communication context. Research (e.g., Nagle, Trofimovich, & Bergeron, 2019) has begun to consider pairs of L2 interlocutors, but studies remain few and far between.

In response to this, the present study aims to explore potentially problematic features of intelligibility and comprehensibility of Korean English for targeted L2 instruction. It achieves this in a first phase of research involving contrastive analysis of Korean phonology against American English, the target phonology of the Korean curriculum. It then tests the intelligibility and comprehensibility of these features for Korean speakers' most frequent ELF interlocutors, L1 Mandarin speakers. In doing so, the study explores issues of intelligibility and comprehensibility within a specific L2-L2 communicative context, adding to our understanding of ELF contexts as a whole. It also aims to establish whether contrastive analysis of the phonological features of a language can produce empirically substantiated insights for targeted pronunciation curricula.

Literature Review

Intelligibility and Comprehensibility Studies

As explained, intelligibility is how *much* raters understand, while comprehensibility is how *easily* raters understand. Sheppard, Elliott, and Baese-Berk (2017) show that intelligibility is commonly measured by transcription of what has been heard, while Isaacs and Thomson (2013) explain that comprehensibility is commonly measured by Likert scales, which have been demonstrated (e.g., Derwing, Munro, & Wiebe, 1998) to be a reliable measure of this.

The bulk of studies in this field have considered intelligibility and comprehensibility of L2 English for 'native' listeners. Some of these studies have shown speakers' L1s to have little effect on intelligibility and comprehensibility. For example, Derwing and Munro (1997) investigated the pronunciation of 48 L2 English speakers living in Edmonton, Canada. The speakers ($n=12$ each) had L1 Cantonese, Japanese, Polish and Spanish backgrounds, yet L1 English Canadian raters ($n=26$) reported no difference in intelligibility based on the speakers' linguistic background. However, other studies have shown a speaker L1 effect. For example, Crowther et al. (2015) explored the intelligibility of L2 English speakers resident in Montréal (L1=Mandarin, Hindi-Urdu, Farsi [$n=15$ each]), finding a significant speaker L1 effect ($p<.0001$, $\eta_p^2=.34$). L1 Mandarin speakers were significantly less comprehensible than others ($d=1.68-2.12$, $p<.0001$). Twenty-one per cent of comprehensibility variance was attributed to phonology, but comprehensibility did not correlate with any phonological aspect except L1 Mandarin speakers' segmentals ($r=.71$, $\alpha=.0025$). A possible reason for the contrasting results between these studies is that, as census data shows (Statistics Canada, 2016), English is spoken as an L1 by 70.4% of the population in Edmonton, but only 10.9% in Montréal. Furthermore, raters were L1 English undergraduate students in the former, and English teachers in the latter study, so participants likely differed in their experience of trying to understand

L2 English. These inconsistencies therefore highlight the important roles of linguistic background and rater experience when measuring intelligibility and comprehensibility.

Intelligibility and Comprehensibility in Multilingual Contexts

While the bulk of studies examine the effect of L1 on L2 speaker intelligibility/comprehensibility, few have explored the effect of differences in rater L1. Examining how raters with different L1 English varieties understand L2 English interlocutors, Saito and Shintani (2016) studied the comprehensibility of Japanese L2 English learners ($N=50$) for ten monolingual Canadian raters (L1=English) and ten multilingual (L1=English) Singaporean raters (L2=Mandarin [$n=9$], Tamil [$n=3$], Malay [$n=3$]), none of whom had communicative experience with Japanese English speakers. The Japanese speakers, whose English acquisition onset was in adulthood ($M=27.8$ years, $SD=5.4$), recorded spontaneous speech samples. On a 9-point semantic differential scale, Singaporean raters found the speech significantly more comprehensible than Canadian raters did ($p=.007$, $d=.52$). The researchers propose that Singaporeans' greater experience of multiple accents may facilitate comprehension. One limitation is that all speaker participants lived in Canada ($M=2.7$ years, $SD=3.1$), and studies (e.g., Jia et al., 2006) show that living in a target language community likely lessens L1 phonological transfer. Another limitation is that all raters had English as an L1, so the findings do not therefore relate to an L2-L2 lingua franca communicative context.

Orikasa (2016) studied the comprehensibility of L1 and L2 English varieties for 37 L1-Japanese raters. Interviews were recorded with eight CEFR C1 learners from Mandarin, Korean, Vietnamese, and American English backgrounds (one female and one male speaker of each, all USA residents). Thirty-seven Japanese participants (CEFR B1) rated the recordings' comprehensibility. Interestingly, the American female speaker was rated as least comprehensible, with the Mandarin speakers rated highest. With only one speaker of each gender per L1, it cannot be claimed that ratings differed significantly by either factor. There was, however, significant negative correlation between speech rate and comprehensibility ($r=-.86$, $p<.02$), and slower speech was the most common reason stated for comprehensibility. This supports Matsuura et al.'s (2014) finding that speech rate can greatly affect comprehensibility for L2 raters.

Saito et al. (2019) examined how 110 L2 English raters with diverse L1s assessed the comprehensibility of L1 Japanese speakers' English speech. Cross-referencing ratings with raters' linguistic backgrounds suggested that strict raters depended highly on phonological accuracy. However, the definition of *accuracy* is of concern. Five L1 English applied linguistics postgraduate students rated the speech samples for targetlike accuracy and fluency on a range of variables. It is unclear what the target was, and whether the raters would agree on a single target. Nevertheless, it is interesting that lenient raters demonstrated stronger metacognitive awareness of comprehensibility's importance, used L2 English in their jobs, and had L1s which were linguistically more proximal to the speakers' L1s (Japanese, Korean, Chinese, and Turkish).

Intelligibility in Lingua Franca Contexts

Deterding (2012) asserts that ELF intelligibility is not necessarily lower than L1-L1 intelligibility. While some phonological commonalities have been researched for their pan-L1 ELF tendencies (Cogo & Dewey, 2006), more recent ELF research explores the fluidity of language within global contexts as part of a larger movement in SLA—the *multilingual turn*. The multilingual turn describes a growing movement in the field to reject a monolingual bias that has underpinned both applied linguistics and SLA theory and research for decades, and has impacted on TESOL practices (May, 2014). This monolingual bias is evident in many intelligibility studies which use L1 English raters to assess L2 English speakers, positioning L1 speakers as the likely target interlocutor despite evidence that L2-L2 interaction is common.

One notable piece of research into ELF intelligibility is Jenkins's (2000) *Lingua Franca Core*—a set of guidelines for teaching pronunciation for ELF usage in an effort to focus “pedagogic attention on those items which are essential in terms of intelligible pronunciation” (p. 123). Restricting the results to segmentals, the *Lingua Franca Core* (p. 134–146) is as follows.

- Aspiration of all plosives
- Avoidance of epenthesis in marked consonant clusters
- Distinction between tense and lax vowels
- Inner Circle-like realisation of all consonants except [θ], [ð] and [ʃ]
- Realisation of /r/ as [ɹ]
- Realisation of /t/ as [t], not [r]
- Realisation of /ɜ:/ as [ɜ:]

Jenkins considers consonants more salient than vowels for ELF intelligibility, and this is supported by Deterding (2012). However, it is concerning that conclusions are drawn from ill-defined classroom data, which were collected ad hoc over several years. Examples are given of six participants (L1=German, French, Japanese [*n*=2], Mandarin, Korean) speaking in various arrangements (Jenkins, 2000, p. 58–66; 81–89), but details regarding, for example, proficiency, tasks, and significance of results are scarce. Further research is needed adopting a focused approach in determining which phonological features affect intelligibility and comprehensibility in lingua franca contexts.

The lion's share of previous studies have focused on intelligibility and comprehensibility in L1-L2 interaction, thus neglecting to represent many L2 speakers' frequent interlocutors. Furthermore, as Jordão (2019, p.38) points out, L1 raters somewhat betray ELF's underlying principle of eschewing a standard 'native' language model. Though we have begun to see studies using L2 English raters (e.g., O. Kang, Thompson, & Moran, 2018), many more are needed. Moreover, while O. Kang et al. (2018) conclude that vowel and consonant divergence is a significant predictor of listening comprehension in L2-L2 English listening contexts, the study does not reveal which particular features affect comprehensibility. The present study responds to and extends this literature by focusing on intelligibility and comprehensibility of segmentals in a context of L1 Korean speakers' L2 English speech, rated by L1 Mandarin listeners who have minimal experience of Korean speakers.

Research Question

The current study addresses the following research question:

Which segmentals and features resulting from Korean phonotactics cause a breakdown in Korean speakers' L2 English intelligibility and comprehensibility for Mandarin L1 background L2 English speakers?

It thus aims to illuminate phonological features of L1 Korean speakers' L2 English pronunciation which impede intelligibility and comprehensibility in a common lingua franca pairing for Korean learners.

Methodology

To answer the research question, the study drew on previous analyses of Korean and English phonology to highlight potentially problematic phonological features of Korean English to inform intelligibility and comprehensibility test items. L2 English raters (L1=Mandarin) then rated utterances by L2 English speakers (L1=Korean). This allowed exploration of intelligibility in a common lingua franca context for Korean learners of English (i.e., with Mandarin-speaking interlocutors).

Selecting Phonological Items

In order to select appropriate Korean segmentals for the intelligibility and comprehensibility test, multiple sources were used to mitigate the limitations of individual sources. There appear to be few recent English-language contrastive analyses of Korean and English phonology, but three were selected due to their immediate relevance to the study, and clarity of methodology and reporting:

- Cho and Park’s (2006) comparison of the phonetics and phonologies of Korean and English,
- Shin, Kiaer, and Cha’s (2012) account of contemporary Korean phonetics and phonology, including contrastive analysis with English, and
- Lee’s (1999) list of Korean phonemes (to standardise International Phonetic Alphabet [IPA] use).

The analyses were mapped onto one chart of segmentals to establish commonalities and differences. In the event of minor discrepancies, the most commonly stated phone was determined to be the most likely realisation, while in the rare event when no two sources agreed, it was assumed that there were a wide variety of allophones for those particular phonemes. The final source provided a comprehensive bank of Korean phonemes and their IPA representation. Some IPA characters and diacritics were altered from those in the cited texts to reflect modern usage guidelines. While there is no standard IPA diacritic for faucalised voice, there is established usage of [.] in the literature (e.g., Edmondson & Esling, 2006), so this is employed here. Figure 1 outlines generally agreed-upon consonants in Korean, used as a basis for our analysis. The descriptions of Korean monophthongs by Lee (1999), Cho and Park (2006), and Shin *et al.* (2012) are charted together in Figure 2.

	Bilabial	Alveolar	Postalveolar	Alveo-palatal	Palatal	Labiovelar	Velar	Glottal
Plosive	¹ p ^h p b _{2,3}	¹ t ^h t d _{2,3}			¹ c ^h c ɟ		¹ k ^h k g _{2,3}	
Nasal	^{1,2,3} m	^{1,2,3} n					^{1,2,3} ŋ	
Tap or flap		² ɾ						
Fricative		¹ s z _{2,3}						^{1 2 3} h
Affricate			² t͡ʃ ^h t͡ʃ t͡ʃ	³ t͡ɕ ^h t͡ɕ t͡ɕ				
Approximant					^{1,2,3} j	^{1,2,3} w	^{2,3} ɰ	
Lateral approximant		^{1,3} l						

1. (H. B. Lee, 1999)
2. (Cho & Park, 2006)
3. (Shin *et al.*, 2012, p.57)

Figure 1. Korean consonants compiled from three sources.

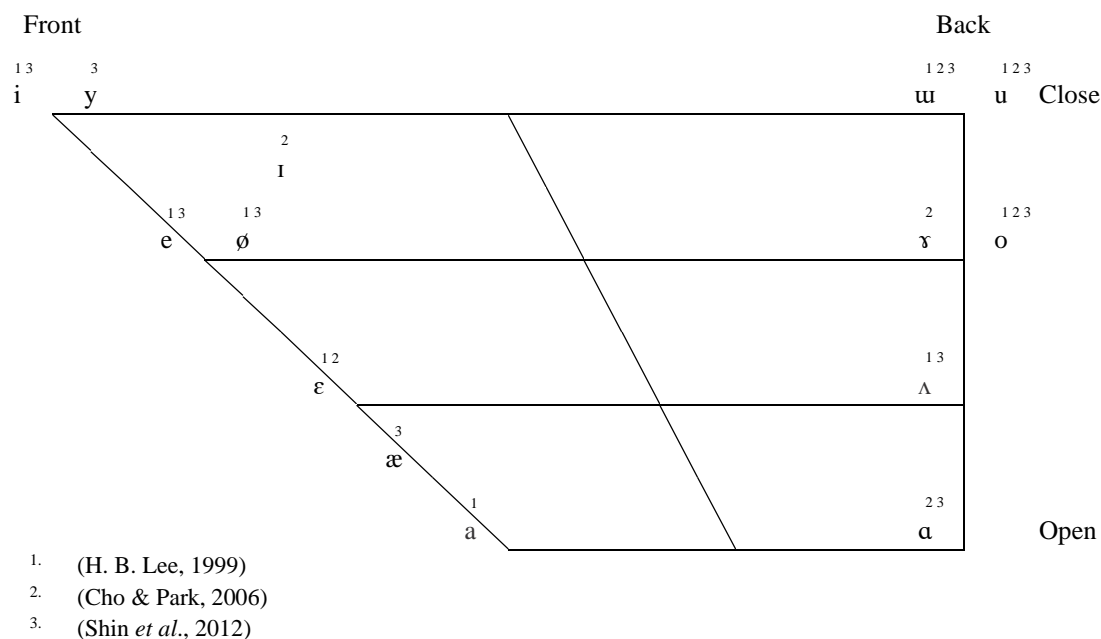


Figure 2. Korean monophthongs.

Beyond the points discussed already, Korean phonotactic constraints differ in many ways from English. Phonologically, the maximal Korean syllable is CVC (consonant-vowel-consonant), while in English it is CCCVCCC. As Cho and Park (2006) and Bauman (2006) explain, this causes inclusion of epenthesis in English consonant clusters. Thus, four items of varying epenthesis were also included in the test. This process revealed numerous features of L1 Korean speakers' pronunciation that were deemed likely to affect English pronunciation, and these were noted frequently by multiple researchers. Though Jenkins's (2000) *Lingua Franca Core* described only one vowel sound likely to hinder intelligibility, Kashiwagi and Snyder (2008) found L2 Japanese speakers' monophthongs ([ɐ], [ə], [ɪ], [ʌ], [ɑ:], [ɔ:], [ɜ:]) and diphthongs ([eɪ], [oʊ]) less intelligible than consonants for L2 Japanese listeners. These features, outlined in Table 1, were used to construct items in the intelligibility and comprehensibility test.

TABLE 1

Likely features of L1 Korean speakers' L2 English pronunciation resulting from phonology differences

<i>Consonants:</i>	/f/-/p/	/z/-/dʒ/	/θ/-/s/	/ð/-/d/	/l/-/r/	/v/-/b/	
<i>Vowels:</i>	/ɪ/-/i/	/ʌ/-/ɒ/	/ʌ/-/ɑ/	/əʊ/-/ɔ/	/æ/-/e/	/ɜ:/-/ɔ:/	/ʊ/-/u/
<i>Korean phonotactics-induced segmentals:</i>	/wʊ/	/si/-/ʃi/	/k/= [ŋ]*	/p/= [m]*	/t/= [n]*	Epenthesis	

* Coda position plosive-nasal substitution preceding sonorant consonants

Speech Samples

For the recordings, a script of 27 short simple sentences ($M=4.74$ words, 1.53 seconds; $SD=1.32$ words, .58 seconds) was written based on the results of the Korean/English contrastive analyses. Twenty-three sentences each exhibited one of the features predicted by these analyses to hinder intelligibility. In order to determine whether the selected features were generally less intelligible than others, three control sentences were devised containing no features likely to cause atypical pronunciation by L1 Korean speakers, and a further sentence was included for procedural practice, appearing before all others. It was essential to minimise risk of low intelligibility or comprehensibility due to syntax or vocabulary. All vocabulary was confirmed with VocabProfiler (Cobb, n.d.) to be in the most frequent 2000-word families, while all syntax was commonly taught in A1/A2-level courses. To ensure that all sentences were decontextualised, each

consisted of only an independent clause, e.g., “I don’t like wool.” in which the word containing the target segmental (in this case *wool*) could not be assumed from context. Lim, Han, Choi, and Lee (2016) found that the number of words does not affect Korean English speakers’ intelligibility or comprehensibility of monologues [$F(1,42)=.77, p=.39$], so sentences were kept short to further decontextualise content. The order of the sentences (26 not including the practice utterance) was then randomised with Haahr and Haahr’s (1998) List Randomizer prior to recording.

Scripted utterances focused on likely problematic segmentals, but in light of Kennedy and Trofimovich’s (2008) finding that context affects comprehensibility, longer spontaneous unscripted speech was recorded to ascertain comprehensibility of more natural, contextualised utterances. Thus, speakers also recorded unscripted speech ($M=50.8$ seconds, $SD=40.17$) to facilitate comparison with more natural pronunciation. To ascertain comprehensibility in spontaneous speech, three prompts on interculturally-familiar topics were devised based on free-speech prompts from common speaking tests such as IELTS® and TOEFL® (e.g., “Do you prefer to live in the city or countryside?”). These contained no cultural references or personal information so that raters would not be influenced by pre-existing cultural or national bias, and to preserve speaker anonymity. These prompts, along with the scripted utterances, are provided in Appendix A.

Speech was recorded in a soundproofed room. After reading scripted sentences, participants were shown the first unscripted prompt, and after a maximum of one minute (as in typical proficiency tests) to consider a response, spoke freely for as long as they wished in order to replicate natural dialogue. In order for each utterance by each speaker to be rated, 28 separate composite files were created, each containing one example of each scripted utterance and of each unscripted response, each by random speakers, and in a random order (though the practice utterance was always first, and all scripted utterances preceded unscripted utterances). Each utterance by each speaker featured in the same number of composite files.

Participant Selection

L2 English listeners ($N=65$) of an L1 Mandarin background were asked to rate L2 English recordings of L1 Korean speakers’ ($N=14$) speech. In order to do this, two populations were sampled. No participants benefitted in any way from participation, and none was trained or prompted in advance. Those who requested a summary of results were given this on completion of this project.

Speaker participants

All recordings were made by first-year Korean undergraduates ($\text{age} \geq 18$) who had never lived outside Korea (as determined by a language background questionnaire), and who thus had minimal phonological influence from uncontrolled experience. None had received any pronunciation instruction since enrolling at university. Since an aim of this study was to make pedagogical recommendations for Korean teachers and learners, only people who had completed pre-university education entirely in Korea recorded speech. Ninety-one people volunteered to participate, and completed the background questionnaire. Forty-four (51.1% male, $\text{age}=18\text{--}19$) recalled a recent language proficiency score, and had neither lived abroad nor repeated years at school. Few had taken an internationally popular test, so results were used from the College Scholastic Ability Test (CSAT: Korean university entrance test, taken by all participants simultaneously). After five participants had piloted recording speech, 14 recorded for this study. These participants reported a mean English CSAT score of 87.93 ($SD=8.17$). 64.3% self-reported use of a “standard” Korean accent, Gyeongsang and Jeolla accents were used by 14.3% each, and 7.1% used a Chungcheong accent. This broadly matches the Ministry of the Interior’s (2019) data regarding the population distribution.

Rater participants

A survey was distributed to young Korean people who had completed their formal education ($N=74$, age=25–35), and this determined that young L1 Korean speakers will likely use ELF primarily with L1 Mandarin speakers. Recordings were therefore sent to raters ($N=65$, L1=Mandarin, 71% female) in mainland China ($n=45$) and Taiwan ($n=20$), who listened to them in a quiet room. They rated utterances for intelligibility by transcribing them by typing in a prepared online questionnaire without spelling assistance, and for comprehensibility with semantic differential scales on the same questionnaire. The median self-reported CEFR level was B1 ($SD=.98$ levels). Thirty-eight were employed in a wide range of jobs, twenty-four were students, and three were unemployed. Raters were recruited by snowball sampling from Mandarin-speaking contacts, as well as from online groups for people interested in learning languages. While this gave the sample a bias—a high proportion of raters were interested in languages—this method allowed for a range of raters who engaged in using English in a range of professions and study disciplines. Twenty-two raters had experienced speaking English with an L1 Korean speaker in the past year.

Procedure

Each rater was sent one of the 28 composite files beginning with the practice utterance spoken by a random speaker, then containing one example of each experimental and control scripted utterance ($N=26$) spoken by random speakers in a random order, all at equal volume. These were followed by one example of a response to each unscripted prompt, also by random speakers in a random order. Since scripted utterances were to be rated for intelligibility and comprehensibility, each occurred twice in succession, separated by a beep. Written instructions of actions to take when hearing beeps (e.g., “Pause”, “Answer the next question”) were used instead of vocal instructions to avoid influencing raters with the instructors’ pronunciation.

After the first occurrence, raters assessed how easily they had understood the utterance (comprehensibility) by using a 7-point semantic differential scale with end points labelled “Very difficult” and “Very easy”. Scales almost always have an odd number of points, ranging from 5 (e.g., Isaacs, Trofimovich, & Foote, 2017) to 9 (e.g., Munro & Derwing, 1995; Trofimovich & Isaacs, 2012), and a 7-point scale was considered best to yield results which could be compared with other studies’ findings. After the second occurrence of the utterance, raters transcribed what they had heard. This measured intelligibility. Transcription of the unscripted speech was considered unfeasible due to length; and results would be confounded by variation in raters’ phonological loop capacity, and by how the speech was parsed. Unscripted utterances were therefore only rated for comprehensibility, so they were not repeated.

Analysis of Ratings

Based on transcriptions, an intelligibility score was ascribed separately to each scripted experimental utterance rated by each rater ($N=1690$). Scripts were devised only to exemplify one feature, so to maintain construct validity, only the focal segmentals were assessed. It is likely that some speakers exhibited these features more than others, but variation in realisation was not taken into account because irrespective of cause (lack of inclusion, or intelligibility/comprehensibility issues), results would nevertheless highlight whether such features are problematic for Korean speakers. Spelling mistakes likely to result in the same realisation of phonemes were accepted. For example, regarding the utterance focusing on [i]-[ɪ] (‘He has a cheap car.’), *cheap car*, *cheep car*, and *sheep car* were accepted, as the focal vowel sound had been transcribed with a possible spelling variant. ‘He has a chip car.’, however, was not accepted, as the vowel sound differed. In experimental utterances, a score of 0 was given for incorrect transcription of the focal segmental, and a score of 1 was given for correct transcription. Since control utterances had no

focal segmental, scores were given for the proportion of correctly-transcribed segmentals, a method derived from Kennedy and Trofimovich (2008), who tallied correctly-transcribed morphemes.

Results: Intelligibility and Comprehensibility

Ratings of utterances' intelligibility and comprehensibility were analysed to ascertain the more problematic features for L2 English listeners. Before analysing these fully, data distributions were determined in order to select appropriate statistical tests. Intelligibility ratings (with the exception of control utterances) were a dichotomous variable on a 2-point scale ($M=.69$, $Mdn=1$, $Mo=1$, $SD=.45$). In this regard, intelligibility ratings could thus be treated as an interval variable; however, unlike most interval data, it was impossible for such a variable to follow a normal distribution. Control utterances ($n=195$), as predicted, were rated as broadly intelligible, with 92% of phonemes transcribed correctly ($SD=.21$). Regarding comprehensibility, an adjusted Kolmogorov-Smirnov Lilliefors test showed that the 7-point ratings also differed significantly from a normal distribution ($p<.0005$). Similarly, comprehensibility scores were not normally distributed for any individual utterance (all $p<.0015$). Comprehensibility skewness and kurtosis were mild ($-.536$ [$SE=.060$] and -1.072 [$SE=.120$] respectively). Since neither rating followed a normal distribution, non-parametric tests were applied to these variables.

Which Segmentals and Features Caused by L1 Phonotactic Constraints Cause Breakdown in L2 English Intelligibility and Comprehensibility?

Experimental and control utterances were ranked by mean intelligibility and comprehensibility ratings so that conclusions could be drawn on which phonological aspects likely impede communication. Comparisons with control utterances were performed to ascertain which utterances were significantly more or less intelligible or comprehensible than speech without predicted difficulties. Since neither intelligibility nor comprehensibility ratings were distributed normally, a series of Mann-Whitney U (MWU) tests were performed to compare the ratings relating to each of the 22 utterance foci (e.g., /f/, Epenthesis \times 2) with the combined control utterance results. That is, intelligibility ratings for /f/-focused utterances were compared with intelligibility ratings for control utterances ($n=195$, $M=0.88$, $SD=0.21$), and so on for each focus, with comparisons repeated for comprehensibility ratings. Utterance foci are ranked below in order of mean intelligibility (Table 2) and mean comprehensibility (Table 3); that is, the focus deemed most intelligible or comprehensible is listed first, and the least intelligible or comprehensible is last. In the tables, CMRD refers to control mean rank difference: the difference between the mean ranks of the focal utterance and of the control utterances. Bonferroni adjustments reduce the asymptotic p value from .05 to .0023, so $p<.0023$ is considered significant, and is marked with an asterisk in the tables. Effect size is calculated following Rosenthal's (1991, p. 19) recommendation of $r = \frac{Z}{\sqrt{N}}$ for non-parametric tests.

TABLE 2

Utterances ranked according to intelligibility

Utterance focus	Intelligibility				CMRD [‡]	U	Asymp p	r
	N [†]	M	5% trimmed M	SD				
[ɔ]-[u] assimilation	65	1.00	1.00	0.00	58.00	3510.0	0.000*	-.398
/əʊ/=[o]	65	0.95	1.00	0.21	49.44	3927.0	0.000*	-.335
[l]-[r] assimilation	65	0.95	1.00	0.21	49.44	3927.0	0.000*	-.335
/si/=[i]	65	0.92	0.97	0.27	43.75	4205.0	0.000*	-.295
/f/=[s]	65	0.89	0.94	0.31	38.04	4483.0	0.000*	-.255
/ð/=[d]	65	0.89	0.94	0.31	38.04	4483.0	0.000*	-.255
[æ]-[ɛ] assimilation	65	0.89	0.94	0.31	38.04	4483.0	0.000*	-.255
Control utterances	195	0.88	0.92	0.21				
/z/=[dʒ]	65	0.86	0.90	0.35	32.33	4761.0	0.001*	-.215
/ʌ/=[v] or [a]	65	0.86	0.90	0.35	32.33	4761.0	0.001*	-.215
[i]-[ɪ] assimilation	65	0.82	0.85	0.39	23.79	5178.0	0.011	-.157
/θ/=[s]	65	0.77	0.80	0.42	15.23	5595.0	0.108	-.100
Epenthesis×3	65	0.77	0.80	0.42	15.23	5595.0	0.108	-.100
All utterances	1690	0.69	0.71	0.45				
Experimental utterances	1495	0.67	0.69	0.47	-24.28	141573.0	0.433	-.107
Epenthesis×1	65	0.66	0.68	0.48	-4.73	6107.0	0.624	-.030
/f/=[p]	65	0.66	0.68	0.48	-4.73	6107.0	0.624	-.030
/v/=[b]	65	0.62	0.63	0.49	-13.28	5690.0	0.172	-.085
Coda /p/=[m]	65	0.54	0.54	0.50	-27.53	4995.0	0.005	-.174
Coda /t/=[n]	65	0.52	0.53	0.50	-30.39	4856.0	0.002*	-.191
/ɜ:/=[ɔ:]	65	0.49	0.49	0.50	-36.09	4578.0	0.000*	-.227
Epenthesis×2	65	0.38	0.37	0.49	-56.05	3605.0	0.000*	-.348
Coda /k/=[ŋ]	65	0.31	0.29	0.47	-70.31	2910.0	0.000*	-.433
/wɔ/=[ʊ]	65	0.28	0.25	0.45	-76.01	2632.0	0.000*	-.467
Epenthesis×4	130	0.15	0.11	0.35	-125.30	2901.0	0.000*	-.690

[†] N refers to the number of ratings

[‡] CMRD refers to control mean rank difference: the difference between the mean ranks of the focal utterance and of the control utterances

In terms of intelligibility, 10 of the 22 predicted features were placed below the experimental mean, and six of these were significantly less intelligible at the adjusted $p < .0023$ level. Epenthesis×4, as in the words *scratched* [sukwɛtʃɪdʊ] and *strengths* [stʊtʊrɛŋθʊsʊ], proved least intelligible at a significant level, as did Epenthesis×2 in words such as *trees* [tʊrɪsʊ]. Epenthesis×1 in the word *green* [gʊrɪn], while below the experimental mean, was not significantly less intelligible. Counter-intuitively, Epenthesis×3 was not below the experimental mean, perhaps an indication of an intelligible word choice (*strange*), rather than the result of intelligible realisation.

Phonotactic features such as the realisation of /wɔ/ as [ʊ] in *wool* were also significantly less intelligible. Phonotactic features resulting in coda position plosive-nasal substitution were significantly less intelligible for coda-position /k/ in the word *trick*, and for coda-position /t/ in the word *quit*. Coda position /p/ in the word *ship* was also below the experimental mean, but not significantly less intelligible than the control. While two consonants /f/ and /v/ were below the experimental mean, they were not significantly

less intelligible. The only vowel to be significantly less intelligible was /ɜ:/, predicted to be realised as [ɔ:] in the word *girl*.

TABLE 3
Utterances below the experimental mean for comprehensibility

Utterance focus	Comprehensibility							
	<i>N</i>	<i>M</i>	5% trimmed <i>M</i>	<i>SD</i>	<i>CMRD</i>	<i>U</i>	Asymp <i>p</i>	<i>r</i>
/əʊ/=[o]	64	5.47	5.65	1.11	41.86	4105.5	0.000*	-.267
[l]-[r] assimilation	64	5.02	5.22	1.57	22.38	5039.5	0.025	-.140
[ʊ]-[u] assimilation	65	4.95	5.13	1.60	21.83	5148.5	0.028	-.137
/si/=[i]	64	4.94	5.15	1.69	21.36	5088.0	0.032	-.134
[æ]-[ɛ] assimilation	63	4.51	4.68	1.87	4.27	5814.0	0.672	-.026
/ð/=[d]	64	4.48	4.59	1.60	-2.55	5989.5	0.801	-.016
Control utterances	191	4.38	4.53	1.93				
/f/=[p]	64	4.28	4.39	1.76	-8.88	5686.5	0.384	-.024
/z/=[dʒ]	65	4.28	4.42	2.00	-4.98	5966.0	0.623	-.031
/θ/=[s]	63	4.24	4.38	2.03	-5.24	5768.0	0.605	-.032
Coda /t/=[n]	64	4.23	4.32	1.69	-10.80	5594.5	0.289	-.322
/v/=[b]	65	4.14	4.23	1.76	-13.20	5567.0	0.194	-.012
[i]-[ɪ] assimilation	65	4.05	4.16	1.89	-15.71	5446.0	0.123	-.096
Epenthesis×3	65	3.92	4.03	2.15	-14.61	5499.0	0.150	-.648
All utterances	1660	3.91	4.01	2.04				
Experimental utterances	1469	3.91	4.01	2.04	-129.14	118462.0	0.000	-.088
/ɜ:/=[ɔ:]	62	3.63	3.70	2.05	-27.90	4615.0	0.007	-.171
Epenthesis×2	63	3.48	3.53	1.97	-34.92	4362.0	0.001*	-.558
/wʊ/=[ʊ]	64	3.44	3.49	1.94	-36.32	4371.0	0.000*	-.221
Epenthesis×1	62	3.26	3.29	2.21	-39.12	4090.0	0.000*	-.345
Coda /p/=[m]	64	3.22	3.24	2.12	-42.04	4096.5	0.000*	-.256
/ʃ/=[s]	65	3.12	3.14	2.05	-47.38	3909.5	0.000*	-.287
/ʌ/=[ʊ] or [ɑ]	64	2.67	2.64	2.13	-57.31	3364.5	0.000*	-.348
Epenthesis×4	126	2.37	2.29	1.82	-85.16	5568.5	0.000*	-.464
Coda /k/=[ŋ]	64	2.36	2.31	1.64	-72.35	2644.0	0.000*	-.437

Table 3 shows utterances by comprehensibility rating. The bottom eight features (marked with *) are significantly less comprehensible than the control utterances, while the top feature (also *) was significantly more comprehensible (Bonferroni-adjusted $p < .0023$). Similar to intelligibility ratings, Epenthesis×2, Epenthesis×4, /wʊ/, and two of the three tested coda-position phonotactic features had significantly lower comprehensibility ratings than the control utterances. The vowel /ɜ:/, while below the experimental mean and significantly less intelligible, was not rated as significantly less comprehensible. The vowel /ʌ/ in the word *some*, and the consonant /ʃ/ in the word *shock* were the only phonemes that were rated as significantly less comprehensible.

On the surface, there appeared to be a correlation between intelligibility and comprehensibility ratings, with seven items appearing on both lists of utterances below the experimental mean. A Spearman's rho test was run to check this relationship, and this showed that intelligibility ratings correlated moderately with comprehensibility ratings [$\rho(1660) = -.434, p < .0005$], indicating that raters' perception of how well

they had understood utterances was somewhat accurate, though this was insufficient to determine actual successful lexical retrieval.

Discussion

This study sought to establish and test the intelligibility and comprehensibility of utterances within an L2-L2 context, drawing on L1 Korean speakers and L1 Mandarin listeners to reflect a common ELF pairing. The segmentals and features in Figure 3 were all rated below the experimental mean for intelligibility. Every experimental utterance included a likely problematic feature for intelligibility, so while sub-mean ratings reflect *lower* intelligibility, this does not imply that ratings above the experimental mean reflect high intelligibility.

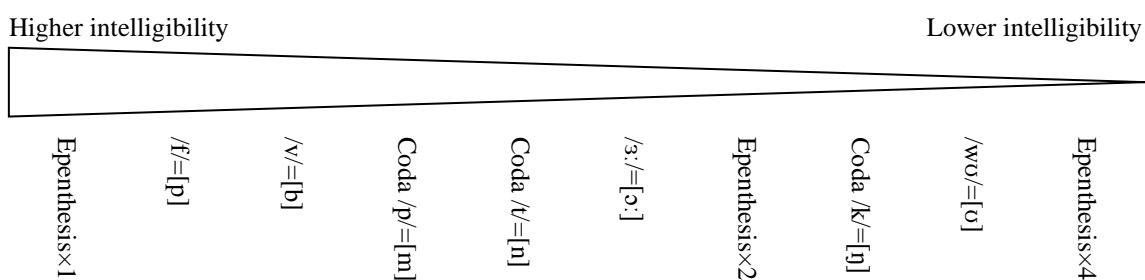


Figure 3. Less intelligible utterance rankings.

Three of the four epenthetic utterances were rated below the experimental mean for intelligibility. Except Epenthesis×3, the higher the number of epenthetic vowels in the word, the lower the intelligibility, with only 11% of words with four epenthetic vowels transcribed correctly. The remaining utterance (Epenthesis×3) was the lowest feature among those above the experimental mean, warranting further investigation. The utterance “That’s *strange*” was intended to elicit three epenthetic vowels in one word. However, only Speaker L6 included all three epentheses; the other 13 speakers omitted the predicted paragogic (word-final epenthetic) [i], ending *strange* with [dʒ]. Of the eight utterances significantly less comprehensible than the control utterances, six (Epenthesis×1, Epenthesis×2, Epenthesis×4, [wʊ], Coda /p/=[m], Coda /k/=[ŋ]) were also less intelligible than the experimental mean. The /p/=[m] and /k/=[ŋ] utterances (along with /t/=[n], which was rated insignificantly below control utterances for comprehensibility, and below the experimental mean for intelligibility) all regarded coda position plosive-nasal substitution preceding sonorant consonants. It thus appears that epenthesis, coda position plosive-nasal substitution, and [wʊ] are the least understood features of segmental pronunciation in this context.

These findings support some features within Jenkins’s (2000) Lingua Franca Core, in that consonants and avoidance of epenthesis in marked consonant clusters appear to be more important for intelligibility than variation in vowel realisations, with the exception of /ɜ:/. This has implications for Korean speakers. While L1 Korean speakers find it easy to nasalise before sonorants, other L1 speakers may not; S. Kang (2012) explains that L1 Korean speakers have difficulty gliding to a high vowel as in [wʊ]; and Matsuura, Rilling, Chiba, Kim, and Rini (2017) find epenthesis in L2 English utterances (L1=Japanese) rated low for intelligibility by Korean ($n=28$) and Filipino ($n=22$) raters. L1 Korean speakers’ realisation of these features may therefore affect intelligibility for other L2 English speakers.

Other findings indicated that vowel intelligibility was largely unproblematic, and at times was aided by a lingua franca context. The /əʊ/=[o] utterance was significantly *more* comprehensible than control utterances, and was also the joint second-most intelligible utterance (95%) overall. Thus [əʊ]-[o]

monophthongisation did not appear problematic for L1 Mandarin raters. Luo and Gao (2011 p. 20) show that /əʊ/ is commonly realised as [oʊ] by L1 Mandarin speakers, so proximity between L1 Korean and L1 Mandarin speakers' L2 English realisations may have aided intelligibility. Similarly, [ʊ]-[u] assimilation appeared unproblematic: every rater transcribed every speaker's realisation of this phoneme correctly.

In a similar vein, the /ð/ utterance was transcribed correctly in 89% of ratings—and this utterance was ranked joint fifth for intelligibility and sixth for comprehensibility. The /θ/=[s] utterance was understood less, although still above the experimental means, ranking 11th for intelligibility and ninth for comprehensibility. Again, the difference could be explained by proximity between L1 Korean and L1 Mandarin speakers' L2 English realisations, with Siqi and Sewell (2012) noting that L1 Mandarin speakers predominantly also realise English /ð/ as [d] and /θ/ as [s]. This supports Jenkins's (2000) assertion that /θ/ and /ð/ realisations are unproblematic, and our data might suggest that shared realisations between L2 English speakers further aided intelligibility as both items were placed above the control utterances and experimental mean.

Similarly, the ranking of the /r/=[ɹ] segmental in the utterance “I hope it doesn't rain.” as the second-most intelligible and comprehensible segmental can also partly be explained by L1 Mandarin speakers' realisation of /r/ being similar to L1 Korean speakers'. Cho and Park's (2006) assertion that L1 Korean speakers' English /l/ is less intelligible than their /r/, might also hold true. Such findings may refute the claim in the Lingua Franca Core that /r/ should be realised as [ɹ] for intelligibility, especially in L2-L2 interactions in which both speakers share common realisations of /r/ which differ from Inner Circle norms. This might also indicate that Korean speakers may be intelligible in other lingua franca pairings with speakers sharing common realisations of /r/, such as L1 Japanese English speakers.

Conclusion

This study found that 18–19 year-old Korean undergraduates' pronunciation of English segmentals was largely intelligible to L1 Mandarin raters: 18 of the 22 features predicted to hinder intelligibility were in fact transcribed correctly by most raters, and were not significantly lower than the controls. This suggests that effort to improve intelligibility of other phonological features may develop an already strong base of intelligible pronunciation. It is therefore important to highlight implications for pedagogy and for teacher attitudes, and to consider limitations and recommendations for future research.

Pedagogical Implications

The phonological features investigated in this study yielded a wide range of mean intelligibility ratings (15%–100%), indicating that some may benefit from pedagogical focus, while others appear not to require further attention in this context. While acknowledging that, as Munro (2018) asserts, some problematic features of L1 Korean speakers' English pronunciation may not have been predicted by our contrastive analyses, it appears that—regarding segmental intelligibility and comprehensibility—teachers and learners in this context could prioritise the following:

- full realisation of word-medial consonant clusters (elimination of word-medial epenthesis),
- realisation of both the [w] and [ʊ] in [wʊ] as in the scripted utterance “I don't like *wool*.”, and
- realisation of coda position plosives preceding sonorant consonants, e.g., the [p] in *shipmate*, by focusing on devoicing.

While we focus on intelligibility here to assist accuracy of understanding, it should be noted that each of these features was significantly less comprehensible than the experimental mean.

It is also important to consider which features are already highly intelligible to L1 Mandarin interlocutors. It appears that extra pedagogic attention to [əʊ] realisation, [ʊ]-[u] distinction, and /r/ realisation would be unwarranted if the aim of a curriculum had a lingua franca focus for example to prepare Korean business or tourism students to engage with Chinese counterparts.

At present, the most widely used pre-undergraduate assessment in South Korea, the CSAT, does not assess language production. Until evaluation changes, pronunciation is likely to remain a secondary focus in education at least before attending university, so it is essential that the attention it receives be effective and useful. It is likely inappropriate to specify all of the features to prioritise pedagogically for L1 Korean speakers beyond what is recommended above; however, the intelligibility rankings in Figure 2 may be a useful starting point for teachers and learners in prioritising which features to address.

Though it appears that pedagogical attention to some phonological aspects would enhance Korean English intelligibility in an ELF context, teachers may be reluctant to guide learners in this direction. Ahn (2014) finds that many L1 Korean teachers of L2 English are reluctant to acknowledge Korean English, preferring American English despite recognising local emerging varieties. It is hoped that such teachers can accommodate an ELF focus in lessons, as this study's general survey found that 46.4% of 25–35 year-old Korean people's English use is with interlocutors from outside the Inner Circle. Thus, current learners will need to be understood by their L2 English interlocutors, so an ELF focus in pronunciation education appears beneficial.

Limitations of This Study, and Recommendations for Future Research

Due to limitations of time and funding, listeners' ratings of the recordings were scored by only one researcher. Some caution should thus be exercised in interpreting results. A replication study is recommended with multiple assessors, and with a larger proportion of raters employed in EFL teaching and other linguistic occupations. Because of utterance length, it was considered unfeasible in this study to measure unscripted speech intelligibility. This would, however, be useful, so in a future replication, raters could transcribe short unscripted utterance extracts which match scripted utterances in length, vocabulary frequency and syntax complexity.

Research on the effect of ELF pronunciation instruction is in its infancy. While this study has identified phonological features which appear to warrant further pedagogical attention, the effect of such focus in lessons remains to be studied. It is thus recommended that future research explore how instruction in these features actually affects intelligibility. Furthermore, as intelligibility is negotiated between interlocutors, a study of the reverse context—L1 Mandarin speakers with L1 Korean raters—is also recommended. Likewise, similar studies, adopting the methods outlined in this study with other learners of English, might also help to inform bespoke pronunciation curricula for L2 English speakers of other language backgrounds.

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Appendix A

Speakers recorded the following scripted utterances, and responded unscripted to the prompts below.

Script

TABLE 4

Scripted utterances

Utterance	Focus	Script	Predicted realisation	
0: Practice		I got ten points in the test.		
	<i>Consonants</i>			
1	/f/	I can't stop <i>coughing</i> .	[p]	[kɒpɪŋ]
2	/z/	It <i>pays</i> a lot.	[dʒ]	[peɪdʒ]
3	/θ/	<i>Three</i> people helped me.	[s]	[sri:]
4	/ð/	I like the <i>other</i> idea.	[d]	[ʌðə]
5	/ʃ/	The news was a big <i>shock</i> .	[s]	[sɒk]
6	/r/	I hope it doesn't <i>rain</i> .	[l]	[leɪn]
7	/v/	There is a good <i>view</i> here.	[b]	[bjʊ:]
	<i>Vowels</i>			
8	/i/	He has a <i>cheap</i> car.	[ɪ]	[tʃi:p]
9	/ʌ/	<i>Some</i> bikes are fast.	[ʊ] or [ɑ]	[sʌm] or [sɑm]
10	/əʊ/	I can't <i>go</i> .	[ɔ]	[gɔ]
11	/æ/	I have a <i>cat</i> .	[e]	[ket]
12	/ɜ:/	There are a lot of <i>girls</i> here.	[ɔ:]	[gɔ:rlz]
13	/ʊ/	You are a <i>good</i> artist.	[u]	[gʊd]
	<i>Phonotactics</i>			
14	/wʊ/	I don't like <i>wool</i> .	[u]	[ul]
15	/si/	I like to go to the <i>sea</i> .	[ʃi]	[ʃi:]
	<i>Phonotactics: coda position</i>			
	<i>plosive-nasal substitution</i>			
	<i>preceding sonorant consonants</i>			
16	[t]	I'm going to <i>quit</i> now.	[n]	[kwɪn]
17	[p]	The <i>ship</i> never moved.	[m]	[ʃɪm]
18	[k]	That <i>trick</i> made it possible.	[ŋ]	[trɪŋ]
	<i>Phonotactics: epenthesis</i>			
19	4× [w] or [ɪ]	He <i>scratched</i> me.		[sʊkʊræʃɪdʊ]
20	4× [w] or [ɪ]	There are two <i>strengths</i> .		[sʊtʊrɛŋθʊsʊ]
21	3× [w] or [ɪ]	That's <i>strange</i> .		[sʊtʊrɛɪndʒɪ]
22	2× [w] or [ɪ]	<i>Trees</i> make me happy.		[tri:tʃu]
23	1× [w] or [ɪ]	It is really <i>green</i> .		[grɪ:n]
24: Control		I like drinking tea.		
25: Control		I like riding my bike on Sundays.		
26: Control		My computer is always a problem.		

Unscripted Speech Topics

- What is your favourite animal, and why do you like this animal?
- Do you prefer cities or the countryside? Why?
- What is the best sport? Why?